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Description

Rotation rate sensor having a vibration gyro

The invention relates to a rotation rate sensor having a vibration gyro, in which circuits which access variable data are provided for operation of the vibration gyro and for emission of a rotation rate signal.

By way of example, EP 0 461 761 B1 discloses rotation rate sensors in which a vibration gyro is excited on two axes which are aligned radially with respect to a major axis, for which purpose a primary and a secondary control loop having appropriate transducers are provided on the vibration gyro. These control loops may include various analog and digital circuits, with the analog circuits and the vibration gyro having tolerances, so that adjustment is necessary, at least during the production of the rotation rate sensor. The individual circuits then access the stored data during subsequent operation. Furthermore, it may be necessary to match characteristics of the rotation rate sensor to the respectively intended purpose, for example by presetting parameter sets for filters.

Storage and management of data such as this in the case of the rotation rate sensor according to the invention can be carried out particularly advantageously by the data being stored in a non-volatile memory which can be written to and by means being provided for reading the data from the non-volatile memory after switching on the rotation rate sensor. The non-volatile memory is preferably an EEPROM or a flash EEPROM.

One development of the rotation rate sensor according to the invention comprises the data being subdivided on the basis of its use into groups, and measures for data protection being taken for one group in each case. For data protection, provision is preferably made for a checksum to be formed over the data for in each case one group, to be stored in the non-volatile memory and to be used for checking during reading.

The development makes it possible to write the data in each of the individual groups to the non-volatile memory, and to edit it, in a mutually independent manner, at different times. By way of example, the adjustment data can thus be stored in the non-volatile memory towards the end of the production process, while parameter sets which relate to the use of the rotation rate sensor, for example the vehicle type in which the rotation rate sensor is intended to be installed, are stored later, by the user.

All of the data which in any way governs the operation of the rotation rate sensor can be stored in the non-volatile memory. In particular, provision is made in the case of the rotation rate sensor according to the invention for the adjustment data and/or parameter sets for filters and/or value limits for self-testing of the rotation rate sensor to be stored.

Another development of the rotation rate sensor according to the invention comprises a software emulation program also being stored in the non-volatile memory.

The invention allows numerous embodiments. One of these will be described in the following text and is illustrated schematically in a number of figures in the drawing, in which:

Figure 1 shows a block diagram of a rotation rate sensor according to the invention, and

Figure 2 shows, schematically, the content of the non-volatile memory.

The example of use shown in Figure 1 represents a rotation rate sensor for a motor vehicle, having a vibration gyro 1 which is part of a sensor module 2. This has a series of circuits for operation of the vibration gyro and for evaluation of the signals from the vibration gyro, including, among other items, a microcomputer 3 which is connected via an SPI bus 4 to a further microcomputer 5, which is also referred to in the following text as a host. The rotation rate information is passed from here via a CAN bus driver 6 to a CAN bus 7 for passing onto other systems in the motor vehicle. Data is stored in an EEPROM 8, is read when the rotation rate sensor is switched on, and is kept available in random access memories for the microcomputers 3 and 5 for access during operation.

Since this is not necessary for understanding of the invention, the vibration gyro 1 and the sensor module 2 will not be explained in any more detail. Since the rotation rate sensor is relevant to safety, monitoring is provided for correct operation of the microcomputers 3, 5, in particular the program execution.

Figure 2 shows the data stored in the EEPROM 8, in a highly simplified form. For example, adjustment data items C1 to Cn are thus stored with an associated identifier IC and a checksum ChSC. Various parameters P1 to Pn for setting filters

are stored in the EEPROM 8, and these likewise have an associated identifier IP and a checksum ChSP.

For safety reasons, monitoring is carried out continuously in the rotation rate sensor during operation, for example by variables being monitored to determine whether they have overshot or undershot their value ranges. The limits of these value ranges may differ from one application to another. Limits L1 to Ln such as these are therefore likewise stored with an associated identifier IL and a checksum ChSL in the EEPROM 8. Finally, a program for software emulation is also stored in the EEPROM 8.